Nanocomposites and nanomaterials

Synthesis and properties of composite materials silica / polymer / enzyme

Payentko V.V., Matkovsky A.K., Nichiporuk Yu.M.[1], Matrunchik Yu. V.[2]

[1]*Chuiko Institute of Surface Chemistry, National Academy of Sciences of Ukraine, 17, General Naumov str., Kyiv 03164, Ukraine, payentkovv@gmail.com*

[2]*The Institute of General and Inorganic Chemistry, National Academy of Sciences of Belarus, 9/1 Surganov Street, Minsk BY-220072, Republic of Belarus.*

Different forms of pain syndromes require an individual approaches with the use of analgesics. Annually in the world market there is a large number of painkillers. For their more effective use, development of preclinical testing methods is necessary, the purpose of which is to obtain an assessment of the effectiveness and safety of medicines by physico-chemical methods. To predict the effect of drugs on a person, pharmacokinetic studies are used based on the establishment of the "concentration-effect" dependence. Traditionally, for such research, animals are used, but in the recent past, alternative test systems are being sought.

Biotransformation of most drugs takes place with the involvement of enzymes in the liver cells. That is why homogenates and suspensions of freshly isolated hepatocytes, subcellular fractions, and enzymes are used for the study of metabolic processes and utilization. Due to the fact that the biological catalysts in their composition lose their activity, there is a problem of their stabilization. This can be achieved by immobilizing enzymes (amidase, cholinesterase) and cells (freshly-isolated hepatocytes) in hybrid silica-polymeric materials, where the polymer creates conditions close to in vivo for the biocatalyst, and the siliceous component reduces the risk of bactericidal effect. Such preparations are stable at storage, are convenient at work. In the course of work, the influence of the nature of the polymer on the activity of the immobilized enzyme is revealed.

The strength of the interaction of adsorbed polymers with the surface of oxides can cause changes in the mechanisms of their thermal decomposition.